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ABSTRACT

This document presents a sample of the Arkansas science curriculum and identifies the content standards for physical science systems, life science systems, and Earth science/space science systems for eighth grade students. Each content standard is explained and includes student learning expectations, eighth grade benchmarks, assessments, and strategies and activities. (YDS)

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Eighth Grade Level Science Sample Curriculum

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Eighth Grade Level Science

STRAND 1: PHYSICAL SYSTEMS
CONTENT STANDARD 1
Students will demonstrate an understanding of physical systems as a process of inquiry.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.1.1. Understand that the laws of science are universal.	Students can explain how the Earth/moon system is affected by gravity. Students understand that a scientific theory is a well-substantiated explanation of some aspect of how the natural world works. The theory explains facts, laws, inferences, and tested hypotheses.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students discuss why the moon follows a elliptical orbit around the Earth. Discuss with students the scientific definition of theory and have them compare it to other definitions.
PS.1.2. Understand that a scientific theory is based on current, accepted evidence and is used to make predictions.	Students can recognize that science theories fulfill the following requirements: (1) the theory can explain what has been observed, (2) the theory can predict that which has not yet been observed, (3) the theory can be tested by further experimentation and be modified as new data are acquired. Students can describe how radioactive dating is used to support the age of the earth.	Statewide Test Teacher-made Test Teacher Observation Portfolio Demonstration Log/Journal Essay Writing	Have students discuss the tests scientific theories must meet to qualify as scientifically valid.
PS.1.3. Generate written conclusions based on evidence acquired through experimentation.	Students can write conclusions based on experimental or observational data collected from research.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students write conclusions using a scientific approach.
PS.1.4. Interpret scientific information from graphs and charts.	Students can interpret scientific information taken from graphs or charts.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Log/Journal Essay Writing	Have students use scientific graphs and charts to make interpretations.

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STRAND 1: PHYSICAL SYSTEMS
CONTENT STANDARD 2
Students will explore, demonstrate, communicate, apply, and evaluate the knowledge of physical systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.2.1. Demonstrate an understanding of the *states of matter* and describe the various combinations of matter (*mixtures* and *compounds*).	Students can identify the states of matter. Students can identify mixtures and compounds in classroom activities.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Exhibition Demonstration Log/Journal Essay Writing	Have students name various states of matter and mixtures and compounds in their classroom activities.
PS.2.2. Identify and describe the properties of an atom.	Students can name the parts of an atom and identify the charges of each part. Students can describe the current model of an atom and give the locations of the parts of the atom. Students can describe the mass number and atomic number of common elements. Students can discuss in general terms radioactivity and its uses and dangers.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students name the parts of the atom and their charges. Have students identify the location of the nucleus that contains the protons and neutrons and the outer part that contains the electron cloud. Have students explain how these charges cause the atom to have a neutral charge. Have students name the mass number and atomic number of common elements and relate atomic number to the number of protons. Have students discuss radioactivity and its uses and dangers.
PS.2.3. Investigate the *periodic chart*.	Students can explain in general terms the organization of the Periodic Table. Students can name and give the properties of common elements. Students can identify the properties of metals and non-metals.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students and teacher explain the arrangement of the periodic chart and locate O, C, Na, Fe, etc. Have students to try to develop their own arrangement of a periodic chart. Explain to students the usefulness of having a periodic chart.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.2.4. Experiment and identify *physical* and *chemical changes*.	Students (given materials) can set up and conduct an experiment that shows a physical change or a chemical change.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students set up and conduct an experiment to show a physical and a chemical change.
PS.2.5. Examine the sources and analyze the preservation of energy resources.	Students research the sources of energy used by man (coal, natural gas, petroleum, solar, and nuclear) and develop ways of conserving this energy and developing alternative energy sources.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students use print and nonprint resources to prepare and communicate an analysis of energy resources and how to preserve them.
PS.2.6. Experiment with *forces* (*gravity*, *magnetism*, and *electricity*).	Students can set up demonstrations of gravity, magnetism and electricity to show how they act on different objects. Students can set up simple, series, and parallel electrical circuits.	Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students conduct experiments involving gravity, magnetism and electricity with a small iron or steel ball and explain what happens. Have students set up simple, series, and parallel electrical circuits using miniature Christmas tree lights.
PS.2.7. Investigate the laws of motion.	Students can explain how the Earth- Moon system is affected by gravity.	Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Students set up demonstrations that show inertia, gravity, friction, and mass. Students create a drawing of the moon orbiting the Earth and explain in writing how Newton's Laws of Motion operate in this example.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.2.8. Demonstrate and communicate the relationship between magnetic fields and electric currents.	Students demonstrate an understanding of a simple circuit. Students demonstrate an understanding of the difference between a generator and a motor. Students identify the parts of a manufactured electric motor.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students build a simple electric motor with a wire, "D" battery, and a magnet. Have students build an electric generator with a wire, "D" battery, and a magnet.
PS.2.9. Introduce the *electromagnetic spectrum* (radio, infrared, visible light, and ultraviolet *waves*, x-rays).	Students can describe radio, infrared, visible light, and ultraviolet waves, x-rays and their properties. Students can describe the speed of light and how light reacts when it passes through a prism and through different lenses. Students can describe the wave nature of electromagnetic spectrum (wavelength, frequency, speed, interference, and diffraction, etc.).	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students verbally and graphically describe electromagnetic waves and give their properties. Have students graphically show the wavelength, frequency, speed, interference, and diffraction of the spectrum.
PS.2.10. Investigate and identify conductors and insulators of heat and electricity.	Students understand that the heat of an object is total kinetic energy of the random motion of atoms and molecules. Students can name objects that are conductors of heat and objects that are insulators of heat. Students can name objects that are conductors of electricity and objects that are insulators of electricity.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students design a model to show the kinetic energy of the motion of atoms and molecules. From items placed on a table by the teacher, have students name conductors and insulators of heat and/or electricity.
PS.2.11. Distinguish energy transfer (*conduction, convection, and radiation*).	Students can describe and give examples of the three ways energy is transferred.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Essay Writing	Have students design models or draw three ways that energy is transferred and give examples.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.2.12. Investigate sound *waves* and gamma rays.	Students can describe the wave nature of sound (wavelength, frequency, speed, interference, and diffraction, etc.). Students describe the benefits and hazards of gamma rays.	Teacher-made Test Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students illustrate wavelength, frequency, speed, interference, and diffraction of sound waves in models or drawings. Discuss with students the hazards and benefits of radiation.

STRAND 1: PHYSICAL SYSTEMS
CONTENT STANDARD 3
Students will demonstrate an understanding of the connections and applications of physical science.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.3.1. Design and conduct different kinds of scientific investigations to answer different kinds of questions.	Students design experiments to test an environmental issue in their community.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students use a pH meter to test water sources in the community. Have them record results and draw conclusions.
PS.3.2. Demonstrate how physical science is connected to mathematics (analyze collected data).	Students can use mathematical formulas to solve problems.	Statewide Test Teacher-made Test Portfolio Performance-based Test Exhibition Demonstration	Have students use physical science/mathematical formulas to solve problems.
PS.3.3. Apply multiple strategies to problem solving.	Students can apply brainstorming techniques in problem solving.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test	Have students brainstorm to solve a problem.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
PS.3.4. Use appropriate equipment, tools, techniques, technology, mathematics, and technical writing in scientific investigation.	Students are aware of and practice safety rules and can identify these rules on exams.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test	Have students identify teacher-made science safety rules. Require students to use properly scientific equipment before conducting experiments. Have students use models, glassware, batteries, electrical connections, magnifiers, magnets, light bulbs, chemicals, Genecons, compasses, spectroscopes, lenses, tuning forks, pulleys, and other simple machines and write about their investigations.
PS.3.5. Investigate a variety of careers related to physical science.	Students research careers in the physical sciences.	Teacher-made Test Teacher Observation Portfolio Performance-based Test Log/Journal Essay Writing	Have students research physical science careers, such as chemist, physicist, astronomer, geologist, engineer, etc.
PS.3.6. Acknowledge the impact of scientific discoveries upon society.	Students can identify men and women of science, cite their discoveries, and discuss their effects on society.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students visit http://www.astr.ua.edu/4000WS/4000WS.html web site for Women in Science. Discuss with students the lives of scientists, such as Marie Curie, Ernest Rutherford, and Albert Einstein.
PS.3.7 Recognize that scientific discovery has been influenced by historical events.	Students can link important scientific discoveries to historical events and show how both are related.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students research the invention of the automobile to discover historical events surrounding this occurrence and the benefits and consequences of this means of transportation.

STRAND 2: LIFE SCIENCE SYSTEMS
CONTENT STANDARD 1
Students will demonstrate an understanding of life science as a process of inquiry.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
LS.1.1. Recognize that science deals only with inquiry about the natural world.	Student can recognize that science theories fulfill the following requirements: (1) the theory can explain what has been observed, (2) the theory can predict that which has not yet been observed, (3) the theory can be tested by further experimentation and be modified as new data are acquired.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Discuss with students the criteria of good science theories: (1) the theory can explain what has been observed, (2) the theory can predict that which has not yet been observed, (3) the theory can be tested by further experimentation and be modified as new data are acquired.
LS.1.2. Interpret scientific information from graphs and charts.	Students can interpret scientific information taken from graphs or charts.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test	Have students individually interpret teacher-assigned graphs and charts and use the information to solve a teacher-assigned problem.
LS.1.3. Conduct investigative science through use of the *scientific method.*	Students can set up an experiment.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration	Have students set up an experiment to study the effect of running water on soil types.
LS.1.4. Generate conclusions based on evidence acquired through experimentation.	Students (as individuals) can form conclusions based on experimental results in LS.1.3. above.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration	Teacher uses a rubric to evaluate the conclusions made by students based on their experiments.

STRAND 2: LIFE SCIENCE SYSTEMS
CONTENT STANDARD 2
Students will explore, demonstrate, communicate, apply and evaluate the knowledge of life systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
LS.2.1. Identify, describe, and explain various types of cells and cell processes.	Students can identify and name the function of the cell membrane, nucleus organelles, RNA, and DNA. Students can describe diffusion, osmosis, and cell-transport	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students view plant and animal and then in a drawing of an empty cell have students draw in each of the structures and give their function. Divide the class into teams and have each illustrate or describe diffusion, osmosis, and cell transport.
LS.2.2. Describe similarities and differences between single celled and multicellular *organisms*	Students can describe similarities and differences between single-celled and multicellular organisms.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students construct a chart of the similarities and differences of single-celled and multicellular organisms.
LS.2.3. Arrange *organisms* into groups according to similarities and differences.	Students will identify various common living things (e.g., bacteria, protists, fungi, plants, sponges, cnidarians, flatworms, roundworms, mollusks, segmented worms, arthropods, echinoderms, fish, amphibians, reptiles, birds, mammals, etc.) and name their characteristics. Students understand why we have biodiversity.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Log/Journal Essay Writing	Have students sort preserved specimens, models, or pictures, students into the correct groups and tell why. Have each student select a different animal and describe its characteristics to the class. Have students discuss why and how biodiversity came into being.
LS.2.4. Identify the requirements for living *organisms*.	Students identify the requirements of living things.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have each student select and research the requirements of a living organism and have the class compares their findings about the various organisms.
LS.2.5. Explain life cycles of various *organisms*.	Students can explain the cycles of plants and animals, e.g., insects, amphibians, reptiles, birds, mammals, ferns, and seed plants.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration	Have students create models of the life cycle of insects, amphibians, reptiles, birds, mammals, ferns, and seed plants.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
LS.2.6. Describe the parts of the human body systems and determine their function.	Students will name the parts of each body system and describe its function. Students will describe common human diseases, their causes and treatments. Students will describe the differences in viral and bacterial diseases that affect these systems.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Using a human model or large chart picture, have students name the parts of each body system and describe its function. Have students research infectious diseases and give their causes, symptoms, and treatments and describe the differences in viral and bacteria diseases.
LS.2.7. Describe how heredity and environment influence/determine characteristics of an *organism*.	Students can describe how genes produce traits and how these traits are passed to offspring (dominant, recessive, probability of passage to offspring, mutations, etc.). Students can describe the effects of environment on offspring as it develops (foods, learning experiences, and parental support).	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students illustrate the probability of a trait occurring in offspring using a Punnet Square and discuss how mutations produce new traits. Have students describe how a trait is passed to a hypothetical offspring. Have students compare the effect of animals raised by normal parents with offspring that are orphans or raised by defective parents.
LS.2.8. Recognize that reproduction is a characteristic of all living *organisms* and is essential to the continuation of life.	Students can describe fertilization, development, and growth in plants and animals.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration	Using models or pictures, have students point out events that occur in fertilization and growth and development of a plant or animal.
LS.2.9. Explain how physical and/or behavioral characteristics of *organisms* help them to adapt and survive in their environments	Students can describe how physical adaptations of plants and animals help them to survive in their environment. Students can identify how behavioral characteristics in animals and humans help them to survive in their environments.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Exhibition Demonstration Log/Journal Essay Writing	Have students describe how physical adaptations and behavioral characteristics of polar bears, brown bears, geese, eagles, desert snakes, deer, cactus, oak trees, and ferns help them to survive in their environment. Have students research how animals and humans learn, problem solve, and adapt to changes in the environment.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
LS.2.10. Describe how genetic material changes through time producing new species while some older species die out and become extinct.	Students understand that life on Earth began 3.5 billion years ago and that there have been several large extinctions, but life has evolved since that time. Students understand that all living things are related to one another through common ancestry from earlier forms that differed from the present forms. Students understand the mechanisms of evolution (e.g., gene mutation, natural selection, and changes in the environment).	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students explain that life on Earth began 3.5 billion years ago and that there have been several large extinctions, but life has evolved since that time. Have students explain that all living things are related to one another through common ancestry from earlier forms that differed from the present forms. Students understand the mechanisms of evolution (gene mutation, natural selection, and changes in the environment).
LS.2.11. Analyze ecosystems in terms of population relationships, *food webs*, energy flow, and *biotic succession*.	Students can identify biotic and abiotic factors, changes in populations, and limiting factors, habitats, niches, and flow of energy in ecosystems. Students can identify various communities and biomes and the succession within these.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Set up a terrarium, aquarium, pond water samples, etc. to allow students to observe over time and identify the biotic and abiotic factors, changes in populations, limiting factors, habitats, niches, and the flow of energy in ecosystems. Have students discuss how what they learn from this applies to the planet. Discuss biome, communities, and succession.
LS.2.12. Evaluate human impact on the environment.	Students can name the natural resources used by humans. Students can provide examples of wise and unwise use of natural resources.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students graphically illustrate wise and unwise use of our natural resources. Have students brainstorm all the things they use for a day and then determine what natural resources they used.

STRAND 2: LIFE SCIENCE SYSTEMS
CONTENT STANDARD 3
Students will demonstrate an understanding of the connections and applications in life sciences

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
LS.3.1. Design and conduct life science investigations to answer different kinds of questions.	Students can identify questions about life that science can and cannot answer in the future.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Essay Writing	Students and teachers brainstorm types of questions that science cannot answer.
LS.3.2. Correlate life science activities to other curricular areas (e.g., language arts, mathematics, social studies).	Students identify life science discoveries that have had an impact on society in the last 10 years. Students can identify the importance of shapes and colors to the life sciences. Students understand the importance of probability to genetics and mathematics to scientific problem solving.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Students and teachers brainstorm and then research life science discoveries that have had an impact on society in the last 10 years. Have students write about how shapes and colors are important to living things. Have students write about how understanding probability and mathematical formulas are important to scientific studies.
LS.3.3. Apply multiple strategies to problem solving.	Students can apply brainstorming techniques in problems solving.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Discuss the rules of brainstorming and then use brainstorming to solve a problem at school.
LS.3.4. Use appropriate equipment, tools, techniques, technology, mathematics, and technical writing in scientific investigation.	Students are aware of safety rules and can identify these rules on exams and in practice. Students can use microscopes, water and soil test kits, dissection kits, medical test kits, aquariums, habitats, computers, etc.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Demonstration Essay Writing	Students properly handle science equipment in a safe and accurate manner. Have students use microscopes, water and soil test kits, dissection kits, medical test kits, aquariums, habitats, computers, etc.
LS.3.5. Investigate a variety of careers related to life sciences.	Students can identify careers in biology sciences.	Statewide Test Teacher-made Test Teacher Observation Portfolio Essay Writing	Have students tudents report on careers in biology, such as biologist, botanist, bacteriologist, zoologist, ecologist, geneticist, horticulturist, ichthyologist, microbiologist, etc.

STRAND 3: EARTH/SPACE SYSTEMS

CONTENT STANDARD 1
Students will demonstrate an understanding of the inquiry process through the study of earth and space systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.1.1. Identify the components of Earth (rocks, water, and air) and their properties.	Students can identify rocks, water, layers of the Earth and atmosphere from models or posters.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Essay Writing	Have students identi fy rocks, water, layers of the Earth, and atmosphere from models or posters.
ES.1.2. Understand that Earth and objects in space constantly undergo changes and/or cycles, which can be observed and measured.	Students describe the Big Bang Theory and the evolution of our sun and planets.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration	Have students design a model or graphic of the Big Bang Theory and the evolution of our solar system.
ES.1.3. Generate conclusions based on evidence acquired through experimentation.	Students draw conclusions based on their experiments.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Log/Journal Essay Writing	Have students test soil area for its fertility and submit a scientific report.
ES.1.4. Interpret scientific information from graphs and charts.	Students can read and interpret earth science graphs, charts, and models.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students interpret scientific information taken for graphs or charts selected by the teacher.

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Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.1.5. Identify and classify rocks and *minerals*.	Students can identify common rocks and minerals based on characteristics such as color, streak tests, hardness, crystal shape, etc. Students can name ways that common rocks and minerals are used by people. Students can identify common rocks found in their area.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Log/Journal Essay Writing	The teacher selects common sandstone, shale, and limestone rocks and common minerals from Arkansas to use in a lab test for students. Have students identify how common rocks and minerals are used in Arkansas.
ES.1.6. Understand the relationship between Earth and objects in space.	Students understand Earth's position in our galaxy and in our solar system.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal	Have students construct a model of our solar system that shows representative distances in the system. Have students graphically show Earth's position in our galaxy.

STRAND 3: EARTH/SPACE SYSTEMS
CONTENT STANDARD 2
Students will explore, demonstrate, communicate, apply and evaluate knowledge of the properties of earth and space systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.2.1. Investigate the formation and properties of rocks *(igneous, sedimentary,* and *metamorphic), minerals,* and *fossils*.	Students research and explore the rock cycle. Students can describe the formation of minerals and fossils. Students can describe the properties of igneous, metamorphic and sedimentary rocks. Students can identify common types of igneous, metamorphic and sedimentary rocks, minerals, and fossils.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Essay Writing	Have students design models or illustrations of the rock cycle and the formation of minerals and fossils. Have students identify common types of igneous, metamorphic, and sedimentary rocks, minerals, and fossils and their properties on lab tests.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.2.2. Understand the relationship, which exists between rock formation, fossil evidence, and geological history and age of the Earth.	Students can identify common fossils found in Arkansas. Students understand the Earth's age to be 4.5 billion + years old based on the age of the rocks determined by radioactive dating. Students understand that life on Earth began 3.5 billion years ago and that there have been several large extinctions, but life has evolved since that time.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students research common Arkansas fossils and bring in fossils they have and identify them. Have students research how scientists date fossils and rocks. Have students construct a timeline of the age of the Earth and advent of life on our planet. Have students construct an extinction chart showing the major extinctions and explain how the dying out of some species affects other species.
ES.2.3. Investigate how Earth's internal processes affect external features (volcanoes, earthquakes, mountain formation, etc).	Students can describe plate tectonics and evidence for continental drift. Students can read topographic maps.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students design models to show the layers of the Earth, how plate tectonics work, mountains and volcanoes are formed, and how earthquakes occur. Have students dentify various landforms and give examples of Arkansas landforms. Have students read the rise and fall of the land on a topographic map.
ES.2.4. Understand the effects of *weathering* and *erosion* on the Earth's surface.	Students can describe how rocks are weathered. Students can describe how soil is formed. Students can identify soil types found in their area. Students can identify and give examples of local erosions and depositions.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students model how rocks are eroded and how soil is formed. Have students sample soil types in a local area and determine the amount of sand, silt, and clay present. Have students photograph area soil erosion and deposition.
ES.2.5. Describe and model the natural divisions of Arkansas.	Students can describe the characteristics and components of each of the natural divisions in Arkansas. Students understand why we have biodiversity in the natural divisions.	Statewide Test Teacher-made Test Teacher Observation Portfolio Exhibition Demonstration Log/Journal Essay Writing	Have six student teams take a research "field trip" to one of the natural divisions and report on the characteristics of each division. Have the teams describe why biodiversity exists in the divisions.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.2.6. Describe the energy transfer within the *atmosphere* as it relates to the development of weather and climate patterns.	Students can describe the properties of air and the layers of the atmosphere. Students can describe how the Sun drives our climate, seasons, and weather changes.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students produce a graphic of the layers and properties of the atmosphere. Have students describe how the Sun drives our climate, seasons, and weather changes.
ES.2.7. Explain and illustrate the *water cycle*.	Students can relate the water cycle to weathering and erosion. Students can construct a water cycle model.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students describe how weathering and erosion are a result of the water cycle. Have students build a water cycle model.
ES.2.8. Model and explain how the Earth's shape and ti lt result in different seasons.	Students can set up a model to explain the different seasons on Earth.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students build a model to explain the different seasons on the Earth.
ES.2.9. Investigate the predictable motion of objects in space in explaining phenomena such as day, night, moon phases, ocean tides, and eclipses.	Students can explain rotation, revolution of the Earth, the moon, and the sun and the relationship each has to the other (day, night, moon phases, tides, and eclipses).	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students set up models to explain rotation, revolution of the Earth, the moon, and the sun and the relationship each has to the other (day, night, moon phases, tides, and eclipses).

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.2.10. Analyze how the features of the oceans affect humans.	Students can describe human uses of the ocean for travel, food production (estuaries), exploration, energy, and mineral sources. Students can describe ocean features, landforms, and pressure and how these have affected exploration of marine frontier.	Statewide Test Teacher-made Test Teacher Observation Portfolio Exhibition Demonstration Log/Journal Essay Writing	Have students research and write a story about human use of the ocean for resources. The story should contain scientific facts on pressure, landforms, and mineral and food resources.
ES.2.11. Compare the ability to support life on Earth and other objects in space.	Students can name conditions needed for life as we know it on Earth and can compare these with conditions we think exist on other planets and moons. Students can describe man's attempts at monitoring life in outer space, e.g., the International Space Station.	Statewide Test Teacher-made Test Teacher Observation Portfolio Log/Journal Essay Writing	Have students research how we have monitored other planets and moons for conditions needed for life. Include in the writing what conditions favor life.
ES.2.12. Explain and compare the properties (*gravity*, size, shape, distance, and color) of objects in the *solar system*.	Students can compare and contrast our sun, planets, moons, meteors, comets and other objects (size, shape, color, distance and gravity). Students can describe the evolution of the universe.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Exhibition Demonstration	Have students construct a poster that depicts a comparison of the objects in our solar system. Have students construct a mural of the evolution of the universe.
ES.2.13. Explore past, present, and future space technology.	Students can depict a history of developments in space programs.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students create skits to depict specific historical events in science, such as moon landings, robot explorations, the development of the shuttle program, and the use of space telescopes.
ES.2.14. Relate the physical characteristics of the sun to other stars.	Students can compare and contrast our sun to other well-known stars. Students can compare our sun's evolution to that of other stars.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal Essay Writing	Have students build models of well-known stars and our sun and compare their size, life history,and evolution.

STRAND 3: EARTH/SPACE SYSTEMS
CONTENT STANDARD 3
Students will demonstrate an understanding of the connections and applications of earth /space systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.3.1. Design and conduct scientific investigations to answer different kinds of questions.	Students can design and conduct a scientific experiment.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration	Have students use print and nonprint resources to research and build a seismograph and then monitor earth movement.
ES.3.2. Apply multiple strategies to problem solving.	Students can apply brainstorming techniques in problem solving.	Statewide Test Teacher-made Test Teacher Observation Log/Journal Essay Writing	Have students discuss brainstorming techniques and then apply them to a selected problem.
ES.3.3. Use appropriate equipment, tools, techniques, technology, mathematics, and technical writing in scientific investigations.	Students are aware of and practice safety rules and can identify these rules on exams.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Demonstration Essay Writing	Students use equipment in a safe manner and answer safety questions on science safety tests. Have students use telescopes, soil and water test kits, rock and mineral test kits, weather charts, thermometers, barometers, hygrometers, psychrometers, wind speed and direction indicators, and earth science computer programs.
ES.3.4. Investigate a variety of earth science related careers.	Students research careers in the earth sciences.	Teacher-made Test Teacher Observation Portfolio Checklist Log/Journal Essay Writing	Have students use print and nonprint resources to research science careers in the earth sciences, such as meteorology, oceanography, seismology, paleontology, ecological, space, chemistry, gemology, soil science, and astronomy, and report to the class. Invite science career people to your classroom to discuss their work.
ES.3.5. Construct models of earth science systems and make real world applications.	Students construct models of the earth systems in their natural division and explain how they function.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration	Have students build models illustrating earth systems.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.3.6. Analyze the impact of human activities on the Earth's *crust, hydrosphere, atmosphere,* and *biosphere* (e.g., climate change, *greenhouse effect,* global warming, ozone depletion, and *UV radiation*) and demonstrate methods of conservation and recycling of the Earth's resources	Students can give the causes of global climate changes through time, greenhouse effect, global warming, ozone depletion and increased UV radiation and how to improve or prevent some of the more damaging problems. Students can demonstrate conservation and recycling at the school and home level. Students can name ways that the nation can conserve and recycle.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Exhibition Demonstration Log/Journal	Have students develop a "television special report" on climate and environmental problems and how to solve them. Have students develop practical ways they can conserve at home and in school and try them for two weeks. Have students determine which practices work best.
ES.3.7. Explore the impact of space technology on society.	Students can research the benefits of space technology and exploration to humans.	Statewide Test Teacher-made Test Teacher Observation Portfolio Demonstration Log/Journal Essay Writing	Have students research and write about how how NASA programs are beneficial.
ES.3.8. Illustrate the positive and negative effects of human use of natural resources on Earth.	Students understand how people have effectively and ineffectively used natural resources on Earth.	Statewide Test Teacher-made Test Teacher Observation Portfolio Performance-based Test Demonstration Log/Journal Essay Writing	Divide the class into two teams do research and debate the pros and cons of wise use of natural resources.
ES.3.9. Measure weather conditions using appropriate equipment.	Students can effectively and safely use science materials and equipment.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Exhibition Demonstration Essay Writing	Have students use weather charts, water and soil test kits, thermometers, barometers, hygrometers, psychrometers, wind speed and direction indicators and weather computer programs to predict the weather in their local area.

Student Learning Expectations	Eighth Grade Benchmarks	Assessments	Strategies/Activities
ES.3.10. Calculate the gravitational forces of objects in space.	Students can calculate the gravitational forces of objects in space. Students can describe in general terms the theory of gravity.	Statewide Test Teacher-made Test Teacher Observation Portfolio Checklist Performance-based Test Demonstration Log/Journal Essay Writing	Have students develop a "news report" on gravity. They must research the theory of gravity on the Internet and include this in their report. They must indicate knowledge of how gravity affects objects in space and calculate gravitation forces on objects.

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